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Developing Innovative Methods of Delivering Indigenous Perspectives through the Science Curriculum to Promote Creativity

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In Australia there are a number of cross-curriculum priorities that are mandated or strongly advised in each of the states and territories (e.g. citizenship, gender equity, literacy, numeracy, sustainability), including several which will be part of the Australian Curriculum. ‘Indigenous perspectives’ is a cross-curricular element that is either mandated or strongly recommended in all state and territory science curricula (Board of Studies New South Wales (BOS NSW), 2003; DEST, 2003). However, where this perspective is to be taught within science programs is not made explicit in every state, leaving teachers to establish where to teach Indigenous culture and how it relates to the subject outcomes in the curriculum document. Indigenous perspectives will be mandated in the Australian Curriculum, as Indigenous culture and history has been embedded within the subject descriptors and classified as one of three ‘cross-curricular priorities’ (Australian Curriculum Assessment and Reporting Authority (ACARA), 2009). The quality and relevance of the cultural and historical Indigenous information shared will depend, as it does currently, upon the resources available to individual teachers (McConney, Oliver, Woods-McConney, & Schibeci, 2011; Ninnes, 2000).

While teachers across Australia are required to give attention to this priority area, there is evidence that they are not always given the professional development and resources to do so. For example, a national survey of 1127 science and mathematics teachers across Australia (Lyons, Cooksey, Panizzon, Parnell, & Pegg, 2006, p. 36) found that this cross-curricular perspective was identified as requiring greater resources and professional development in science.

Focus of the Study

In two studies I recently completed as part of my Masters in Education, secondary school science teachers from across Australia identified Indigenous perspectives as an area in which they felt they needed an increase in resources and support. When this survey was extended to an interview it was found that some science teachers were not even aware of the need to teach Indigenous perspectives through the science curriculum and if they did recognise this mandatory cross-curriculum perspective, many were not confident or competent in delivering science from an Indigenous perspective. By empowering teachers with a knowledge base they will have the ability to be more creative in their teaching approach. This will in turn provide students with the skills to develop creative responses to innovative open-ended material and ultimately also become the knowledge base for another group. By promoting an innovative atmosphere students are able to learn in a way that is meaningful and allows them to express their knowledge and understanding in the creative ways that they are comfortable with.

Indigenous perspectives can be taught through a range of topics in science and I feel that programs that would actively inspire innovation and creativity among students would be those that are largely open-ended. I am seeking resources and knowledge to support programs that take students on a journey.

The intention of this study is to impact the competence and confidence of science teachers in their delivery of Indigenous perspectives across NSW. The knowledge I sought and the scaffolding I hope to develop will be mostly transferable across all regions as the focus will be on location of resources and support as well as the structure in which to embed creative and innovative learning and teaching activities and programs.

I teach in a Central School in regional NSW with a population of Indigenous and non-Indigenous students. In developing activities, lessons, programs and scaffolding I have also benefited professionally as I now have the means to deliver Indigenous perspectives through the science curriculum innovatively and creatively.

Significant Learning

What I found during my Study Tour really surprised me. There were a number of key findings as a result of numerous interviews with leading academics, teachers and school’s office personnel. These included the significance of involvement of community in designing and implementing programs and activities that deliver Indigenous perspective, the definitions and interpretation of Indigenous perspectives, who should/could be implementing Indigenous perspectives and material that teachers might like to consider using to assist in developing programs.

Involvement of Community in Developing Programs Incorporating Indigenous Perspective

All of the academics I spoke to could not emphasise enough the importance of working with community to develop programs and activities that bring Indigenous perspective into the classroom. Local Aboriginal families and community members need to be able voice what they believe are the educational and social needs of their children at school and in the classroom. If this is not one of the first key steps in program development then the program itself is likely to have minimal success.

Dr Glen Aikenhead talked about the collaboration between science teachers, local Elders, students and community members in the development of Rekindling Traditions, a series of units based on Aboriginal cultural knowledge. These units were shared between different Nations who changed them as they saw the need. Glen acknowledged the busy life of teachers and stressed that these changes were often not made by teachers, but by Elders, community members and students. What really struck me about the development of these units was that the Aboriginal knowledge shared in science classrooms was local, not broad or general.

Dr Neil Harrison, Macquarie University, talked about breaking down the barriers within the school environment when establishing relationships with local Elders and community members. It can be difficult and confronting for many parents to access the school, passing through the office can be overwhelming. He suggested meeting off school grounds for informal activities, such as barbeques to get to know everyone, which could be best completed in a local park for example. Dr Bronwen Cowie, Waikato University, also suggested developing relationships with parents and caregivers outside of school hours, in a non-threatening environment.

Dr Irene Oakes is Professor and director of school-based practicum in the Saskatchewan Urban Native Teacher Education Program (SUNTEP) at Saskatchewan University. Prior to working in the university Dr Oakes had been a classroom teacher and principal. She became principal of an elementary school that had commenced following removal of children by their parents from another local elementary school. This was a result of poor inclusion and education of First Nations and Métis students. The first thing she did in that school was to communicate with the local community and parents to find out what they wanted her to do. She always made sure that she was in contact with parents and made her school into a community. She believes this is what makes schools successful.

Mrs. Julie Bishop, principal of Clovelly Park Primary School in Adelaide has had considerable success in implementing programs to assist Indigenous students. In every school she has been in she had worked incredibly hard to develop positive relationships and always involve community. One story that she shared was about a camp that she took young female primary school teachers on, a women’s only camp, where local community members taught them how to cook local foods and engaged them in traditional song and dance. Mrs. Bishop talked about how the women from the community became the leaders during this camp, telling Mrs. Bishop what she needed to do and being clear if she was doing something wrong. It was eye opening for the young teachers who worked with her and they asked her why she allowed herself to be ‘bossed around’. Mrs. Bishop replied to the teachers that it was a privilege to be able to be taught such traditions and to be a part of the community. Everything that Mrs. Bishop does involves community, she is in constant contact with parents and caregivers.

Dr Aikenhead suggested establishing relationships to ensure I had the local knowledge and resources necessary to develop a teaching that incorporated Indigenous perspectives. He urged me to establish a relationship with The Keeping Place, an Aboriginal cultural and education centre in Armidale, and also with Oorala, the Aboriginal support unit at the University of New England in Armidale. He was impressed with the inclusion of Aboriginal Education Aides in schools in New South Wales, but stated it would be important to have a number of people to go to for assistance.

In Saskatoon the Public Schools Office has developed an education team who represented local First Nations and Métis communities. The team is a combination of Elders and traditional knowledge holders. The team is incredibly busy, as they are able to bring professional development opportunities to fifty-two local schools. Teachers are able to contact the First Nations, Inuit and Métis Education Unit at the Public Schools Office, state what area they are teaching and what area they would like assistance with, and a Knowledge Keeper will contact them and come into the school. The knowledge is local and in many ways a program such as this one assists in breaking down barriers teachers may have put up to delivering Indigenous knowledge, culture and history.

In going into a school with Mrs. Auntie Faye Maurice, a Métis Knowledge Keeper, and Mr. Henry Gardipy I was able to observe the development of relationships between the Education Team and local community. The teacher asked Mr. Gardipy if he would work with some of the boys, as they had been displaying poor behaviour to some of their teachers and it was felt that cultural responsibility would be of benefit. Mr. Gardipy insisted on involving families and local community prior to the commencement of any extra-curricular program. In this way parents were aware of what was happening and would have the opportunity to have input. The occasion would be an after school celebration with food where Mr. Gardipy would have the opportunity to display his drumming skills and describe the program. I found this to be very insightful.

Dr Aikenhead is a true leader in the work that he has completed. Over a number of decades he has established relationships to improve learning outcomes for Indigenous students. When I told him that many teachers in Australia were hesitant to teach Indigenous knowledge and culture in their classrooms for fear of making errors he responded with ‘doing something is better than doing nothing at all’. He felt that teachers were using it as an excuse; he believes that they must take responsibility for their teaching and build up a repertoire of knowledge. If the knowledge shared is broad and not local to begin with, it doesn’t matter; he felt it more important that teachers were beginning to break down barriers to prejudice and racism in their classrooms. Mr. Jim Taylor, a lecturer in the Teacher Education Program at Saskatchewan University, had a similar view to Dr Aikenhead. He felt that teachers did need to be developing relationships with local families and community, but that teachers were better to be doing something in their classrooms rather than nothing for fear of being wrong. Other academics had slightly different opinions; these will be discussed in the next section of this report.

Definitions and Interpretation of Indigenous Perspective

On a few occasions it was necessary to explain what was meant by the term Indigenous perspective. In the context of the NSW BOTSE syllabus documents and Australian Curriculum, Indigenous perspective is the inclusion of Indigenous history and culture in specified areas of the curriculum. Some academics I spoke to discussed other areas of Indigenous education that they believe belongs to the Indigenous perspective paradigm.

Dr Mere Berryman has successfully implemented Te Kotahitanga in more than fifty schools in New Zealand. Te Kotahitanga focuses on ensuring that every member of staff in the school is culturally responsive. This is a holistic approach to implementing Indigenous perspective in schools. The program was developed by asking Indigenous students what they saw as the teacher’s role in cultural education. She said there was an overwhelming response in regards to teachers delivering Indigenous culture and history: students do not want to be told who they are. To be culturally responsive to students in this program means to respond to the needs of the individual and consider their immediate cultural background. Obviously in these schools this is not just occurring in science, but throughout the entire school. Presently the program has been implemented only in schools with high Indigenous population. Dr Berryman made a point of stating that Te Kotahitanga is beneficial to all students, as all have differing backgrounds and prior experiences that will have a profound impact on how they learn.

What Dr Berryman meant by this became clearer upon completing my interview with Dr Neil Harrison. Dr Harrison is very interested in space and place pedagogy. In teaching his pre-service science teachers he ensures that he does not reinforce stereotypes when bringing Aboriginal perspectives to his lessons. He does this by becoming familiar with local communities wherever he is placed and becoming familiar with people’s areas of expertise. He then enables these people to share their expertise with his students. In this way these individuals are able to have informal conversations with his students whilst also sharing their expertise, and stereotypes are broken down as students become familiar with an individual rather than the idea of a group of people. One such example was when Dr Harrison had a local artist work with his students on a mural at the university. Whilst working and painting the students were able to speak with the artist and get to know her as a person, understanding and appreciating her background, history and culture.

Dr Bronwen Cowie was able to share with me culturally responsive programs that had been implemented at the primary school level. Sometimes these were science education programs that had an increased focus on peer teaching and collaborative learning, such that the pedagogical style is supporting the learning styles of students from varying cultural backgrounds. Another unit that Dr Cowie shared with me was based around a native species of lizard, tuatara. Students learnt about the habitat the lizards are found in, practised skills in observation by drawing the lizards and listing their characteristics and ultimately their adaptations. As part of this unit students were also told traditional stories of tuatara by members of the local Indigenous community. This stimulated students to bring their own culture to the unit of work. Tuatara had great significance to one student’s family and their father was able to show the class his family’s carved tuata or pou whakairo. Fathers also had the opportunity to be involved in the unit of work when they were invited to assist students to make clay models of tuatara. In this way parents were able to have involvement in tasks that were not perceived as threatening.

Resources for Australian Teachers

I had the opportunity to meet with Dr Duane Hamacher at the University of New South Wales, one of Australia’s leading expert on Aboriginal astronomy. Dr Hamacher has focused on specific regions of Australia, studying the physical use of astronomy of Aboriginal Australians as well as the cultural connections to specific constellations. One example is Emu in the Sky. The position of this constellation in the night sky was an indication of the breeding cycle of the emu. It specified to Aboriginal groups when emus’ would lay their eggs and when these eggs were ready to hatch. Dr Hamacher recommended the [Aboriginal astronomy blog](http://aboriginalastronomy.blogspot.com.au/) as a useful teaching resource. He is also going to have the students in his course at UNSW develop resources for disseminating Aboriginal astronomy. A researcher has also created an add-on for Stellarium (a free open source planetarium for computer that shows a realistic sky in 3D) that shows students the constellations known to Boorong people. I would recommend that any teachers who would like to know more about Aboriginal astronomy in their region or find out more about resources available contact Dr Hamacher.

I met up with Dr Rachel Popelka-Filcoff and Dr Claire Lenehan at Flinders University to obtain information on how to bring ochre into the science curriculum. They had some amazing ideas. Rachel warned that the discussion of ochre in terms of traditional stories, uses and ceremony is very sacred and advice must be sought very sensitively. They advised talking more generally in lessons about the traditional use of ochre on a national level, rather than locally. I think that the distances travelled to access and trade for ochre would fascinate all students. Red, shiny ochre was the most highly sought after and is considered particularly sacred. People would walk from far north Queensland (as we call it) all the way to South Australia to seek red ochre. Wild tobacco would often be exchanged for the ochre.

Some of the ideas that Dr Popelka-Filcoff and Dr Lenehan came up with for classroom inquiry into ochre were:

* + mixing pigments
	+ firing yellow pigments to observe colour change
	+ photographing ochre in different lights and measuring the chroma, perhaps by using an app
	+ looking at the effect of different light filters on the perceived colour of ochre
	+ looking at the effect on viscosity, cracking or stickiness of ochre by changing binders (eg. egg, water or milk)
	+ observing colour before and after grinding ochre with a mortar and pestle
	+ bserving crystal size and shape before and after grinding ochre
	+ comparing crystal size and shape of different pigments.

Conclusion

The variety of academics and educational experts in Indigenous and Science Education that I met with as part of my Study Tour have shaped my understanding of teaching Indigenous culture. I now appreciate that this is an incredibly sensitive area of education and it is vital to spend time and resources developing quality relationships with local Indigenous community members. As well as developing these relationships it is crucial to provide local families and communities with the opportunity to state what they want from the school for their children. The needs of local families and communities, of any cultural background but certainly Indigenous students, must influence the development of programs implementing Indigenous perspective through the curriculum, whether this be culturally responsive pedagogy or delivering cultural knowledge and history through the curriculum.

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Endnote

Useful resources for teachers can be found at my [blog site](http://nswptsnhilton.blogspot.com.au)